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SANTA CLARA VALLEY WATER DISTRICT

ENGINEER'S REPORT
ON PROPOSED FLOOD CONTROL MEASURES ON
BERRYESSA CREEK
(LOWER PENITENCIA CREEK TO CALAVERAS BOULEVARD)
EAST ZONE
PROJECT NO. 4017

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SANTA CLARA VALLEY WATER DISTRICT

ENGINEER'S REPORT ON PROPOSED FLOOD CONTROL MEASURES ON BERRYESSA CREEK

(LOWER PENITENCIA CREEK TO CALAVERAS BOULEVARD)

EAST ZONE

PROJECT NO. 4017

May 1975

prepared by
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Santa Clara Valley Water District

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SAN JOSE, CALIFORNIA 95118
TELEPHONE (408) 265-2600

May 20, 1975

The Honorable Board of Directors
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, California 95118

Gentlemen:

Transmitted herewith is the Engineers Report on Proposed Flood Control Measures on Berryessa Creek, Project Number 4017, from Lower Penitencia Creek to Calaveras Boulevard. This project is within the City of Milpitas in Flood Control Zone E-1 (East) of the Santa Clara Valley Water District.

This report describes the proposed flood prevention works consisting of a modified earth channel with levees, and the construction of a Southern Pacific Railroad bridge and a Western Pacific Railroad bridge. The proposed project will be aligned along the existing creek from Lower Penitencia Creek to the SPRR and WPRR crossing; a distance of approximately 2500 feet. The proposed project will follow a new alignment from the railroad crossing to approximately 4300 feet upstream, then along the existing creek for a distance of 1800 feet to Calaveras Boulevard. The estimated cost of the proposed work is $2,964,000 based upon July 1975 prices.

The proposed improvements, when constructed, will prevent major flooding in the floodplain areas of Berryessa Creek between Sinclair Freeway (Route 680) and Main Street and between Jacklin Road and Calaveras Boulevard. Part of this area is the City of Milpitas Civic Center.

I concur in the project as proposed and recommend that this report be circulated for public review as a prerequisite to setting a time and place for a public hearing.

Sincerely yours,

John T. O'Halloran

John T. O'Halloran
General Manager

Enclosure

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9 Plan and Profile (Station 69+00 to Station 79+65)

10 Plan and Profile (Station 79+65 to Station 87+80)

11 Plan and Profile (Station 87+80 to Station 94+07)

INTRODUCTION

Berryessa Creek is located in the northeasterly portion of Santa Clara County and is within the East Zone of the Santa Clara Valley Water District. It lies partially within the City of San Jose, the City of Milpitas, and the County of Santa Clara. The portion of Berryessa Creek that this engineer's report will deal with begins at the confluence of Berryessa Creek and Lower Penitencia Creek, easterly of the Nimitz Freeway and southerly of Dixon Road, upstream to Calaveras Boulevard, just westerly of Interstate 680. Upstream portions of the creek will be treated in future studies and reports.

The existing Berryessa Creek is inadequate to handle the District's design flood. The culverts under Main Street, Southern Pacific Railroad and Western Pacific Railroad are undersized and have been causes of historical overbank flooding. Flood damage resulting from creek overflows in the past has been mainly to farm lands, however, new residential, commercial and industrial developments are planned for this portion of the City of Milpitas. The creek traverses an area that is planned by the City of Milpitas to be the Civic Center of the City of Milpitas. It is imperative that flood protection be provided to this area so that Milpitas may proceed toward the fulfillment of its master plan.

In order to eliminate the potential flooding hazard and minimize erosion, this portion of Berryessa Creek must be reconstructed.

Alternative types of improvements have been studied to develop the most desirable solution to the problem. This report presents the results of studies of this portion of Berryessa Creek and consists of:

1. A general description and map of the proposed channel improvement, together with maps showing plans, profiles and typical cross sections required, rights of way and easements, and location of the proposed project.

2. An estimate of the cost of the proposed project and suggested means for financing these costs.

DESCRIPTION OF WATERSHED

Berryessa Creek is located in the northeasterly sector of the Santa Clara County and is bounded by the Calera Creek watershed to the north and the Penitencia Creek watershed to the south. It flows westerly through its tributary areas from an elevation of about 2500 feet in the Los Buellis Hills to an elevation of about three feet above Mean Sea Level at its confluence with Lower Penitencia Creek. The major portion of the tributary area lies in the unincorporated area of the County with the lower portion of the creek passing through the City of San Jose and the City of Milpitas.

The Berryessa Creek watershed which is shown on Figure 1 and Figure 2 is approximately rectangular in shape, having a length of about 7.2 miles in the east-west direction and a width of about 5.4 miles in the north-south direction. The total watershed area is about 17.3 square miles. About 5.4 square miles of the watershed is on the valley floor and about 11.9 square miles is in the hilly area east of Piedmont Road.

The valley floor, once used extensively for agriculture is being developed into light industrial, commercial and residential uses. There is some residential development on the steeper terrain east of Piedmont Road. It is conceivable that about two-thirds of the watershed will eventually be urbanized.

The soils on the steeper portion of the watershed consist predominantly of adobe clay and gravelly clay type soils. A

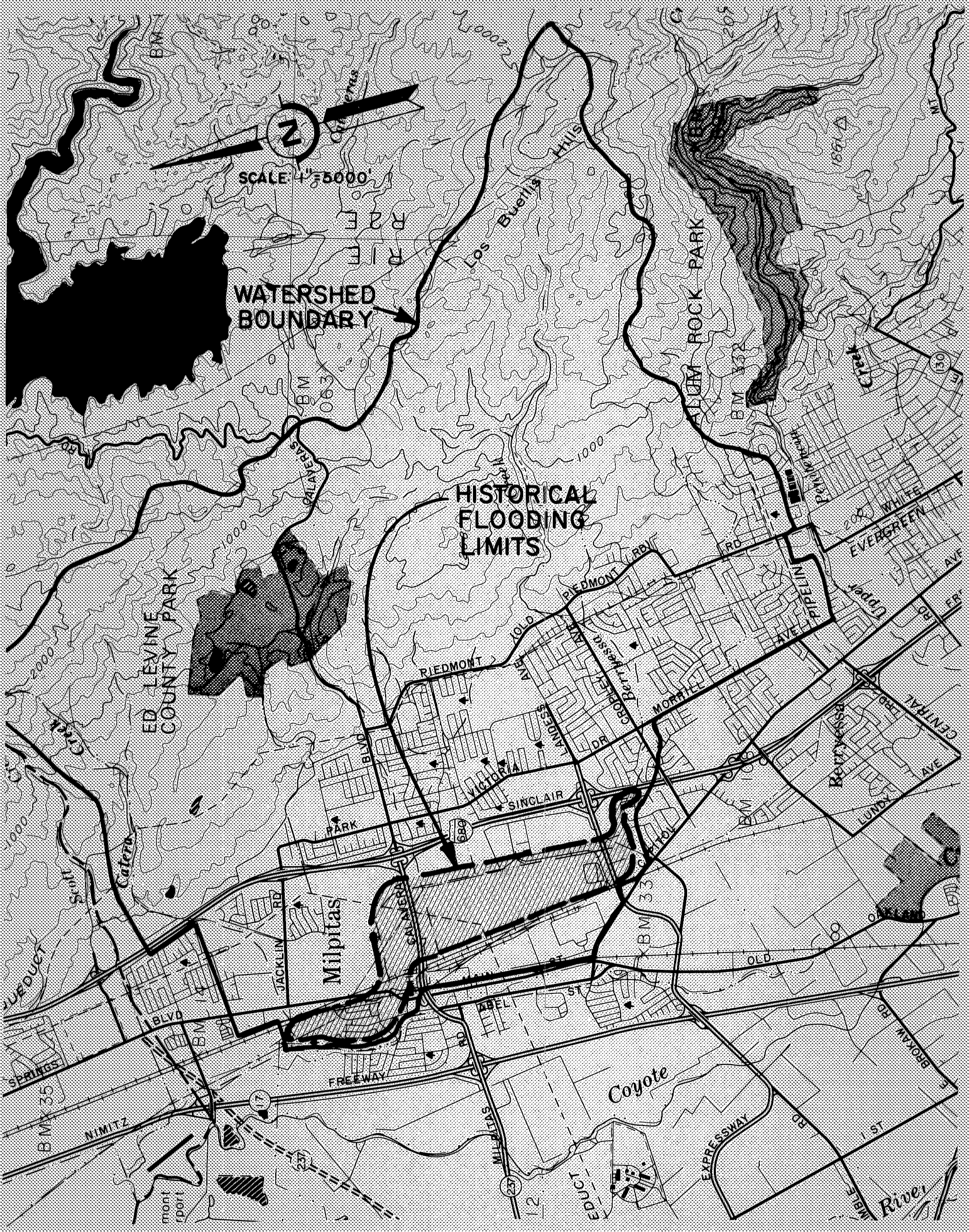


FIGURE I - BERRYESSA CREEK WATERSHED AND HISTORICAL FLOODING MAP

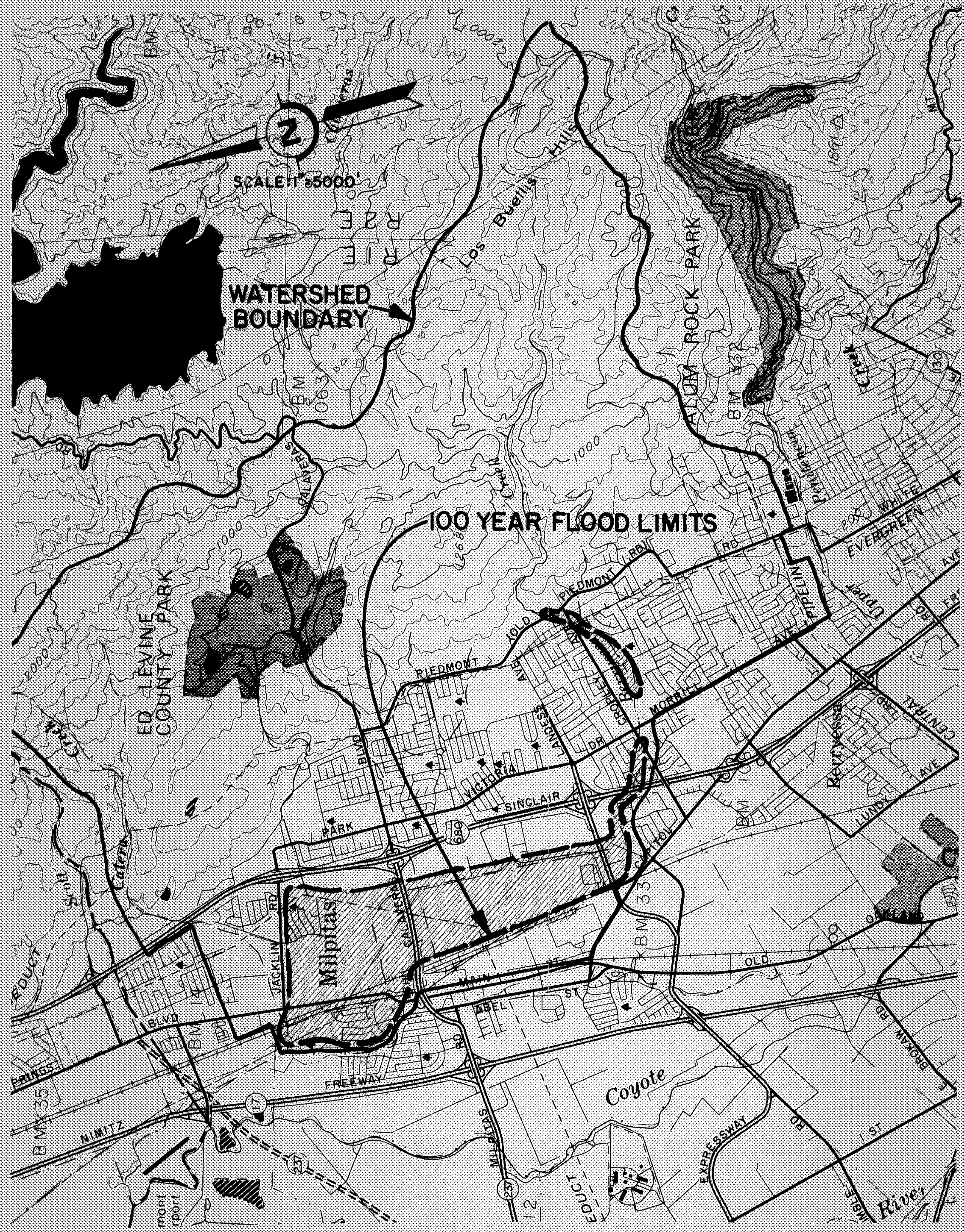


FIGURE 2-BERRYESSA CREEK WATERSHED AND 100 YEAR FLOODING MAP

considerable portion of the hilly area is underlain with serpentine hardpan, which induces slides and causes relatively rapid return of any infiltrated flow to the stream channels. In the central portion of the watershed the soil is predominantly of a clay loam type, while in the flatter areas of the lower part of the watershed the soil is predominantly of a clay type. These soils have a relatively low permeability and, therefore, the rate of runoff is high.

Native growth in the hills of the eastern portion of the watershed consists of scattered oak, madrone, and bay trees with underlying brush and grass. This type of vegetation is effective in reducing the runoff for low rainfall intensities but has little effect on the higher intensity rainfall which produces the design floods.

DESIGN CRITERIA

The criteria used in the design of Berryessa Creek follow accepted engineering standards. Economic evaluations of alternative channel designs were based on estimates of construction costs including engineering and inspection costs, right of way values and the present worth of possible future maintenance costs.

Completed improvements will make the channel free from erosion and will provide a level of protection designed to safely convey a one percent flood (the so-called 100-year recurrence frequency flood) to a point of disposal. The design flood flows meeting this standard for Berryessa Creek were computed using the results of a regional flood frequency hydrologic analysis. This multiple correlation analysis, based on historic data from gaged watersheds, was utilized to determine the peak flood flow in accordance with area, mean annual precipitation, and basin shape. Moreover, since a portion of Berryessa Creek watershed is highly urbanized, special considerations were given to the design flows accounting for all the tributary flows through a system of storm sewers within the watershed. The design flows thus obtained for the project are as follows:

TABLE 1

Station	Design Reach	Watershed Area in Acres	Design Peak Flow cfs[1]
10+00	Confluence with Lower Penitencia to confluence with Calera Creek	11,000	4,600
17+00	Confluence with Calera to confluence with Tularcitos Creek	11,000	4,100
82+00	Confluence with Tularcitos to Calaveras Boulevard	9,700	3,500

1. cfs = cubic feet of water per second.

DESCRIPTION OF PROPOSED PROJECT

The proposed project begins at the downstream end of Berryessa Creek at the confluence of Berryessa Creek and Lower Penitencia Creek. From the confluence, Berryessa Creek will be aligned along the existing creek to a point just downstream from the proposed Southern Pacific and Western Pacific railroad bridge. From the proposed bridges, the channel will be diverted from the existing creek and on a new alignment for a distance of approximately 4300 feet to a point where the channel will join the existing creek. From this point the channel will be aligned along the existing creek for a distance of about 1800 feet to Calaveras Boulevard.

The basic channel cross section will be a modified trapezoidal earth section, with levees. Approximately 600 feet of trapezoidal concrete lined channel is proposed for the vicinity of the future Southern Pacific and Western Pacific railroad crossings. A trapezoidal concrete confluence structure is proposed for the confluence of Tularcitos Creek and Berryessa Creek. This structure will have a drop in channel grade on Berryessa Creek of about 2 1/2 feet. The structure is needed to prevent erosion from flows entering Berryessa Creek from Tularcitos Creek and is also needed to protect the City of San Francisco's Hetch Hetchy pipelines. The Hetch Hetchy pipelines slice diagonally across Berryessa Creek at its confluence with Tularcitos Creek.

Berryessa Creek has two tributary creeks along the project reach. Calera Creek enters Berryessa Creek approximately 1000 feet upstream from Lower Penitencia Creek. Tularcitos Creek enters Berryessa Creek about 1100 feet downstream of Calaveras Boulevard.

The right of way needed for the proposed project varies in width from 140 feet to 180 feet. The District owns 80 feet of right of way along the existing creek except the reach from Lower Penitencia Creek to Calera Creek where the District's right of way is 100 feet wide. The District does not own land along the 4300 feet of new alignment from the future railroad crossing to a point 4300 feet upstream. Approximately 26 acres of additional land will be needed for the proposed project. All of this right of way is expected to be dedicated to the District by developers of the surrounding lands.

The existing railroad crossing of Berryessa Creek is too small and too low to pass the design flows. The proposed alignment of the creek will cut-off the existing railroad crossing. Berryessa Creek will cross the Southern Pacific and the Western Pacific railroads at a point on the new creek alignment. The Southern Pacific railroad tracks will be raised 4.2 feet and the Western Pacific railroad tracks 2.9 feet at the site of the new railroad bridges. The embankment for the new railroad bridges will extend approximately 1500 feet north and 1500 feet south of the new railroad bridges.

A pair of temporary tracks realignments, called shooflies, will be constructed, one for each railroad. The shooflies will be just easterly of each existing railroad tracks. After the shooflies are constructed and rail traffic shifted to them, the raising of the existing tracks and the construction of the bridges will start.

The City of Milpitas will award a contract which will include the construction of the Abel Street overcrossing during the summer of 1975. The Abel Street overcrossing will cut diagonally across Berryessa Creek and the two railroads at a point just downstream from the proposed Southern Pacific and Western Pacific railroad bridges. When the Abel Street overcrossing is completed and open to traffic the City of Milpitas will abandon Main Street. Therefore, it will not be necessary to build a new bridge across Main Street. The alignment of Berryessa Creek has been changed from earlier plans to utilize much of the existing Main Street right of way.

A substantial flood gate will be constructed where the old channel reenters Berryessa Creek. The flood gate will allow local drainage to be released into the creek. A flood gate is a structure that prevents flood flows in the creek from backing up into the storm drainage pipes and channels.

The existing Berryessa Creek south of the diversion point, although cut off from the main channel, will be maintained as a local drainage facility. Most of the surface water drained from

Tract 2545, as well as two small existing drainage ditches, Ford Ditch and Wrigley Channel, will still pass through this existing portion of Berryessa Creek.

The District will landscape the constructed channel after all the heavy construction is complete. The landscaping will be mostly native plants and will be so selected and placed as to encourage wildlife. Tules and cattails, both natives to this section of the creek, will be allowed to grow in certain areas for wildlife enhancement and aesthetics.

A portion of the abandoned existing creek will be backfilled if excess earth material is generated from the proposed project.

The entire right of way of the project will be fenced with a type of fencing that will be compatible with the landscaping.

ALTERNATIVES CONSIDERED

Several alternatives have been studied during the past six or seven years. A previous engineer's report was adopted by the District on December 5, 1967 and included three different alignments for this reach of Berryessa Creek. The type of channel cross section, an excavated trapezoidal earth channel with levees, was the same for all three alignments. The proposed project uses a slightly modified version of the alignment and cross section recommended in this previous report.

Nature has put some tight constraints on what can be done to provide flood protection to this area. Due to the general area wide land subsidence that has occurred in this area of Santa Clara County since 1900, San Francisco Bay tidal waters now extend up Berryessa Creek to approximately the confluence of Berryessa and Tularcitos Creeks. Therefore, digging a deeper channel would not decrease the height and size of the levees needed to contain the flood flows. The possibility of future land subsidence must be accounted for by designing a facility that is flexible enough to be economically raised some time in the future. The proposed modified trapezoidal earth channel with levees fulfills all these requirements.

The use of a rectangular concrete channel, a trapezoidal concrete lined channel, a gabion lined channel, an underground conduit (box culvert or pipes), and a modified floodplain were considered.

A rectangular concrete channel would be three times more expensive than the proposed channel. Areas of poor foundation material would require that the heavy rectangular structure be put on piles or extensive overexcavation be done to provide a good foundation. It would be very costly to add height to this channel in the future, and would effectively eliminate any multipurpose use of the creek.

A trapezoidal concrete lined channel would be approximately 30 percent more expensive than the proposed earth trapezoidal channel. It would not allow for much multipurpose use because of the steep sideslopes and the hard surfacing.

A gabion lined trapezoidal channel would be as large as the proposed channel. Gabions are wire baskets filled with rocks. Gabion lining is generally used where the floodwaters will be flowing moderately fast. Because of the influence of the bay waters, and the very flat slope of the surrounding ground, the velocity will always be low in this portion of Berryessa Creek, thus negating the need for the extra expense of having gabion baskets placed on the channel side slopes.

An underground conduit would be completely unfeasible as it would have to be flowing under pressure and would not allow for local drainage to enter the conduit without an excessively large retention and pumping system. It also would be many times more expensive than the proposed channel.

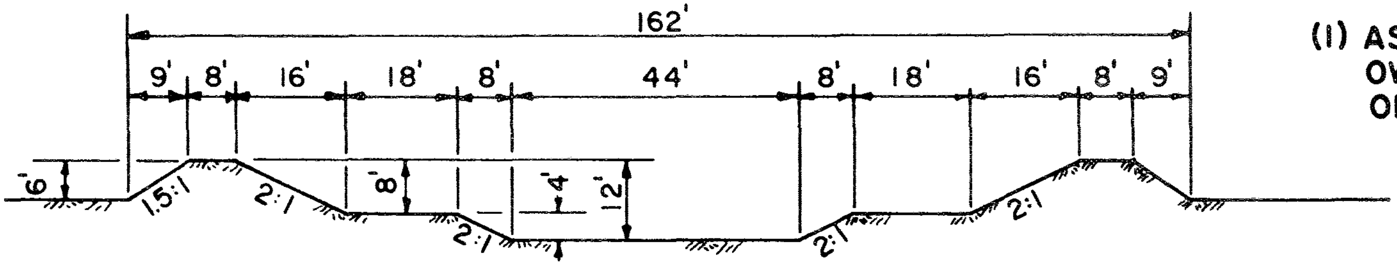
The existing channel is a modifed floodplain that could not be satisfactorily increased in size to provide adequate flood protection. The existing channel is not a "natural channel" with a mature riparian habitat. Modified floodplain type flood protection is most commonly used when a valuable naturally vegetated creek is worth saving, similar to the lower and upper reaches of Coyote Creek in Santa Clara County. Land values in this area are very high and it is not desirable to provide more creek right of way for open space than planned by the City of Milpitas. Open space needs will be met by a combination of nearby parks in combination with the proposed channel.

A summary of the costs of the three most feasible alternatives, these being the earth trapezoidal, the concrete lined trapezoidal channel and the rectangular concrete channel is shown in Table II.

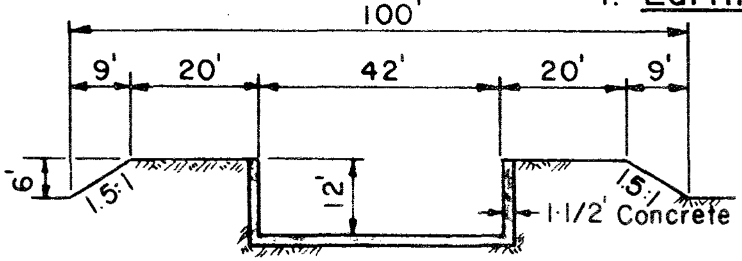
Alternative	$ Earthwork	$ Concrete	$ Landscaping	$ Total Construction	Engineering Inspection 35% $	$ (1) Right of Way	$ Total Cost per Foot
1. Earth Trapezoidal Proposed Project	48	0	32	80	28	324	432
2. Rectangular Concrete Channel	41	780	20	841	294	200	1335
3. Concrete Lined Trapezoidal	50	156	24	230	80	240	550

L=8650'

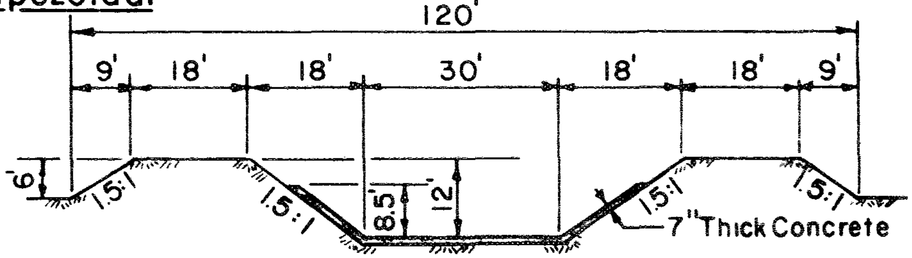
(1) ASSUMES DISTRICT OWNS NO RIGHT OF WAY.



1. Earth Trapezoidal



2. Rectangular Concrete



3. Concrete Lined Trapezoidal

Table II Cost Comparison & Alternatives for Berryessa Creek-Total Cost per Foot

CONSTRUCTION STAGING

Flood protection measures to be constructed for the proposed project will be constructed in two stages because of the neccesity of coordinating the proposed flood control project with the City of Milpitas' Abel Street Overpass.

Stage 1 will consist of constructing the earth channel from Lower Penitencia Creek to the railroad bridges, Station 7+63 to 29+94, and constructing the earth channel from just upstream of Main Street to Calaveras Boulevard, Station 42+00 to 94+07. Included in this reach will be the confluence structure with Tularcitos Creek.

Stage 2 will consist of constructing both railroad bridges (Southern Pacific Railroad and Western Pacific Railroad) and all required channel work between Stations 29+94 and 42+00. Also included in Stage 2 will be the construction of temporary shooflies and raising of tracks to meet the raised bridges. Prior to Stage 2, both oil pipelines and the communications cable will be relocated by the utility companies. This stage will not be completed until Main Street is abandoned by the City of Milpitas and the construction can take place within the existing Main Street right of way.

Complete flood protection for this area will not be provided until both stages are completed.

PROJECT FINANCING

Project financing will be from the ad valorem taxes in the East Zone of the District and from contributions from the City of Milpitas. The land needed for the project that is not already in District ownership will be dedicated by private land developers. The estimated revenues and their sources are shown in Table III.

TABLE III

Sources of Financing

Stages Limits of work	Water District	City of Milpitas	Private Developers	Total
Channel Construction Lower Penitencia to Calaveras Boulevard	$ 319,000	$302,000	$485,000	$ 1,106,000
Utility Relocations Shoofly Construction and SPRR & WPRR Bridge Construction	1,858,000	0	0	1,858,000
TOTAL	$2,177,000	$302,000	$485,000	$2,964,000

PROJECT COSTS

Estimates of the cost of construction of the proposed flood control measures on Berryessa Creek were based on July 1975 prices. In addition to the construction costs, an estimate is included to account for the costs of engineering, construction inspection and other contingencies such as advertising, legal fees and other incidentals. The estimated value of the right of way to be dedicated is also included.

TABLE IV

Estimated Project Costs

(July 1975 Prices)

Limits of Work	Construction	Engr. Insp. Contingencies 35%	R/W	Total
Stage 1				
Channel Constr. Lower Penitencia to Calaveras Boulevard	$ 460,000(1)	$ 161,000	$485,000(2)	$1,106,000
Stage 2				
Utility relocation at RR Crossing	200,000	70,000	0	270,000
Shoofly Constr.	425,000	150,000	0	575,000
SPRR and WPRR Bridge Constr.	750,000	263,000	0	1,013,000
TOTAL	$1,835,000	$ 644,000	$485,000	$2,964,000

Notes:

(1) Includes $50,000 for landscaping

(2) Right of way to be dedicated by developers

CONCLUSIONS AND RECOMMENDATIONS

1. The existing creek channel is incapable of containing the one percent flood flows. The incidence of flooding and resulting damage to downstream property will increase as urbanization of the Berryessa Watershed progresses.

2. New bridges must be constructed to span the creek at the Southern Pacific and Western Pacific railroad crossings. The existing railroad tracks must be raised.

3. The most feasible solution, considering the environmental aspects, engineering constraints, the economics and the urbanization pattern, for providing one percent flood protection on Berryessa Creek is an earth channel from the confluence with Lower Penitencia Creek to Calaveras Boulevard.

4. An allowance for landscaping has been included in the estimated construction costs.

5. The total estimated cost for the project including construction, landscaping, right of way, engineering, inspection, and contingencies is $2,964,000.

Based on these conclusions, it is recommended that this report be circulated for public review as a prerequisite for setting a time and a place for a public hearing.

Submitted by:

Bruce Wilson

Bruce Wilson
Division Engineer
Design Division

Approval Recommended:

Edwin Ferguson

Edwin Ferguson
Branch Engineer
Design Branch

Approved:

George Korbay

George Korbay
Design and Construction Manager

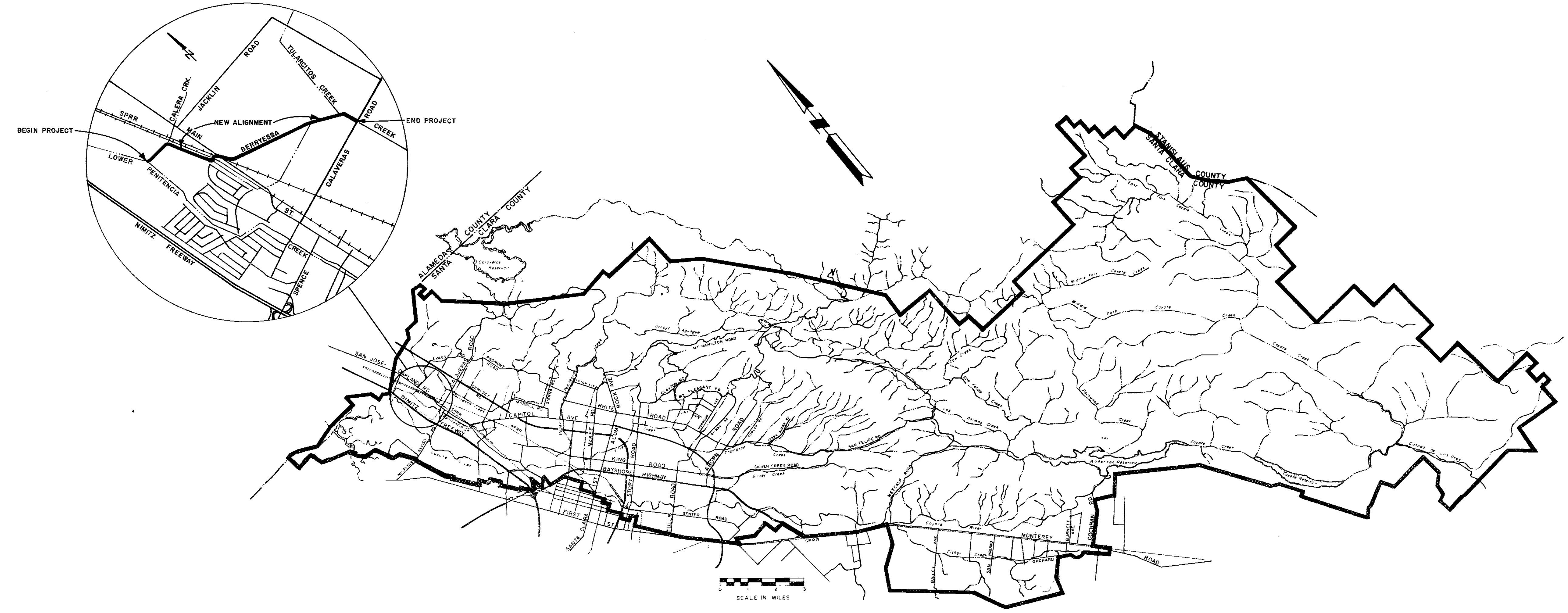
MAP AND GENERAL PLAN
FOR
BERRYESSA CREEK

FROM LOWER PENITENCIA CREEK TO CALAVERAS BLVD.

IN THE CITY OF MILPITAS, CALIFORNIA

Santa Clara Valley Water District

EAST FLOOD CONTROL ZONE **PROJECT NO. 4017**

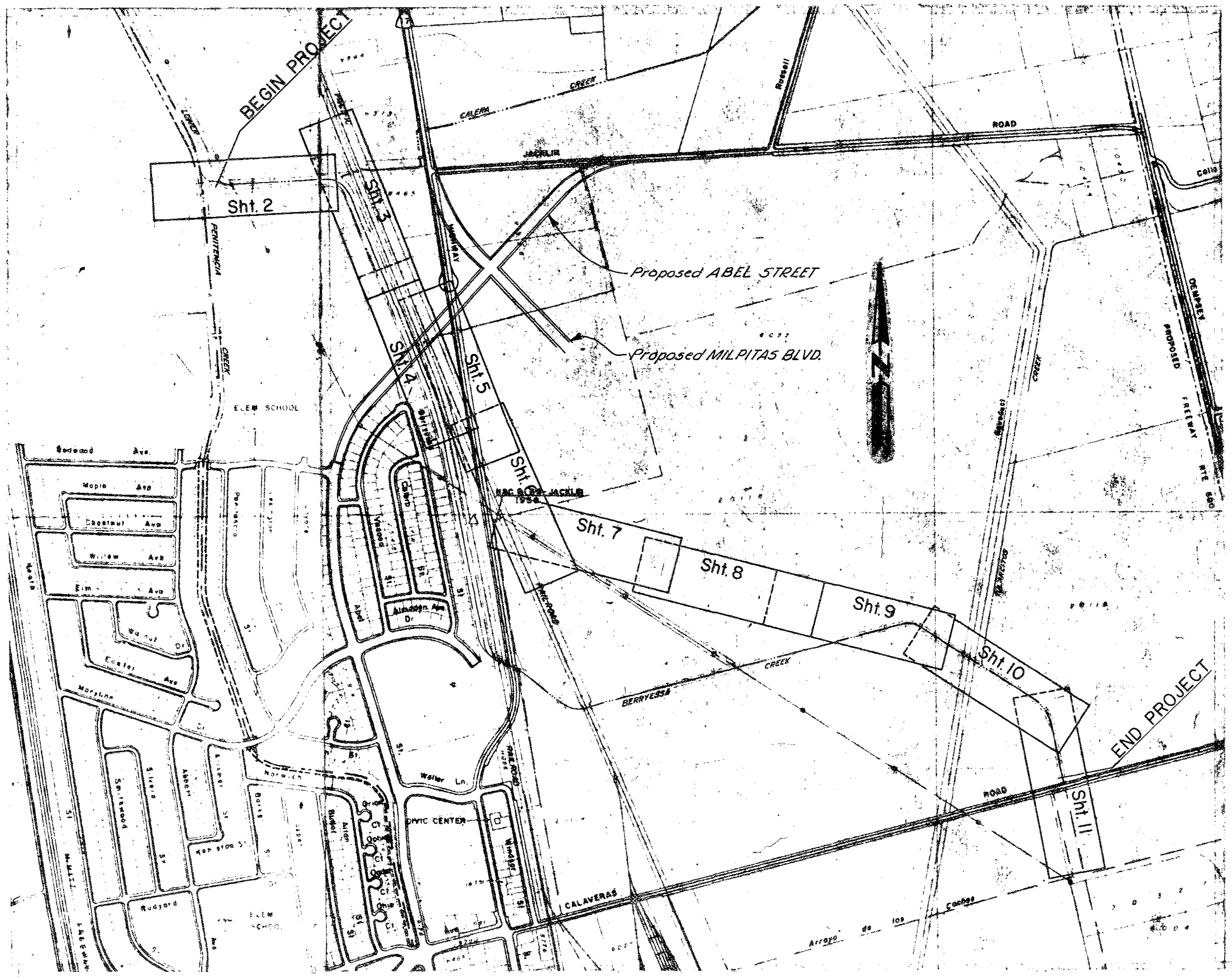


PROJECT APPROVAL:

DESIGN AND CONSTRUCTION MANAGER

for George Korbay
CHIEF ENGINEER

DATE: May 15, 1975



SITE MAP

REFER TO TRACING FOR LATEST REVISION			
REV	DESCRIPTION	SUB	APPR

REFERENCE INFORMATION AND NOTES

DATE	5-20-75
DESIGN	M.F.
DRAWN	R.J.F.
CHECKED	M.F.

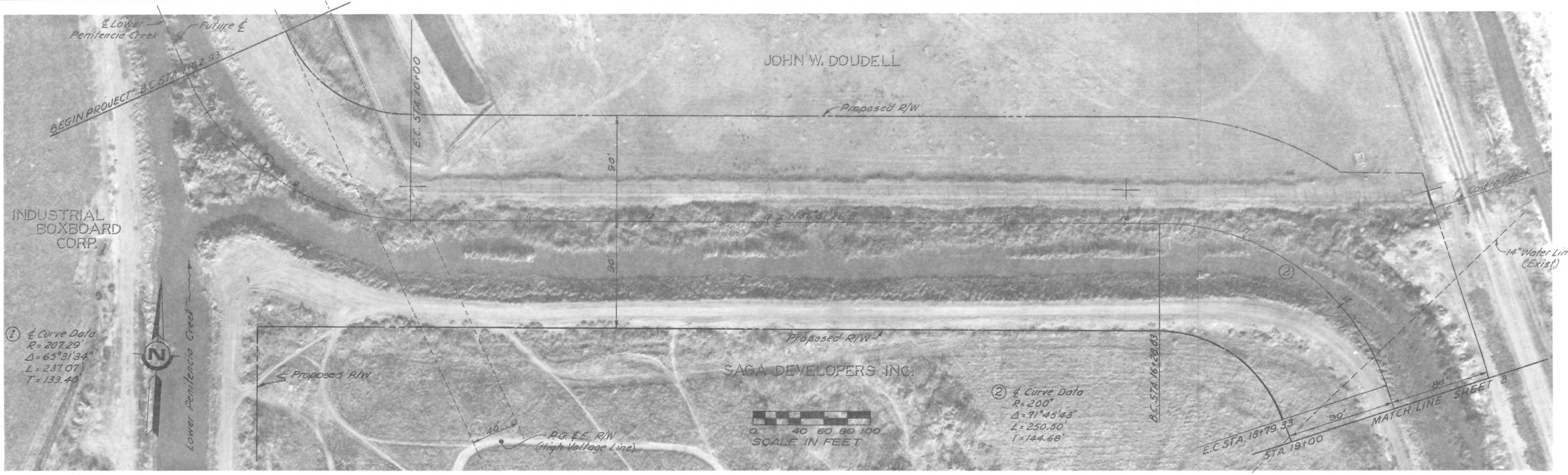
Santa Clara Valley Water District

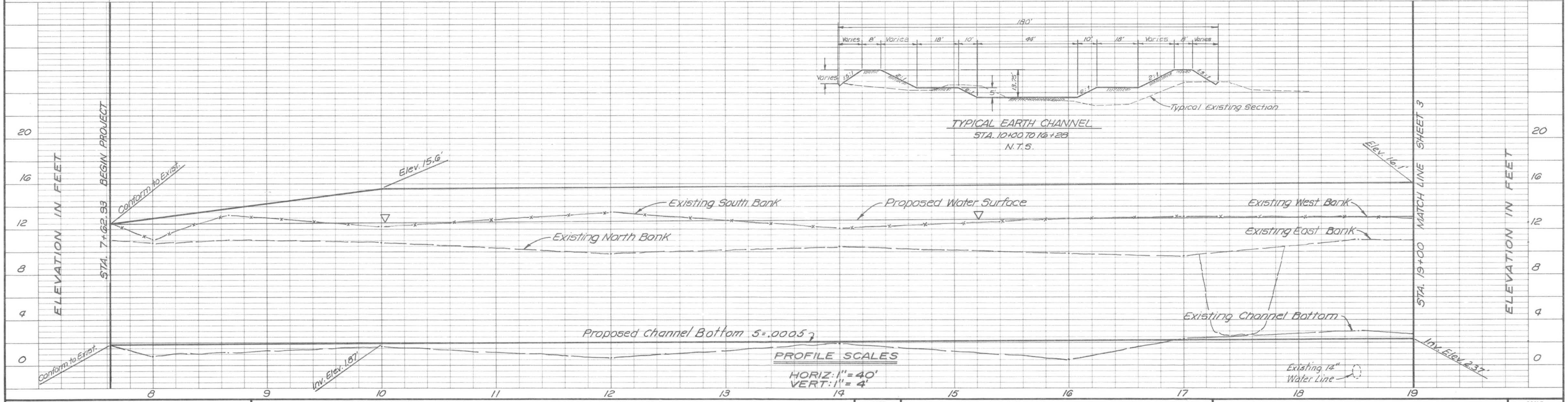
ENGINEERING CERTIFICATION
Michael Freitas
PROJECT ENGINEER
Bruce Wilson
DIVISION ENGINEER R.C.E. NO. 15851

ENGINEERING APPROVAL
Edwin Ferguson
HEAD, DESIGN BRANCH R.C.E. NO. 14455

ZONE E-1
BERRYESSA CREEK
SITE MAP

SCALE 1"=500'
SHEET A





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DATE 5-20-75
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CHECKED M.F.

Santa Clara Valley Water District

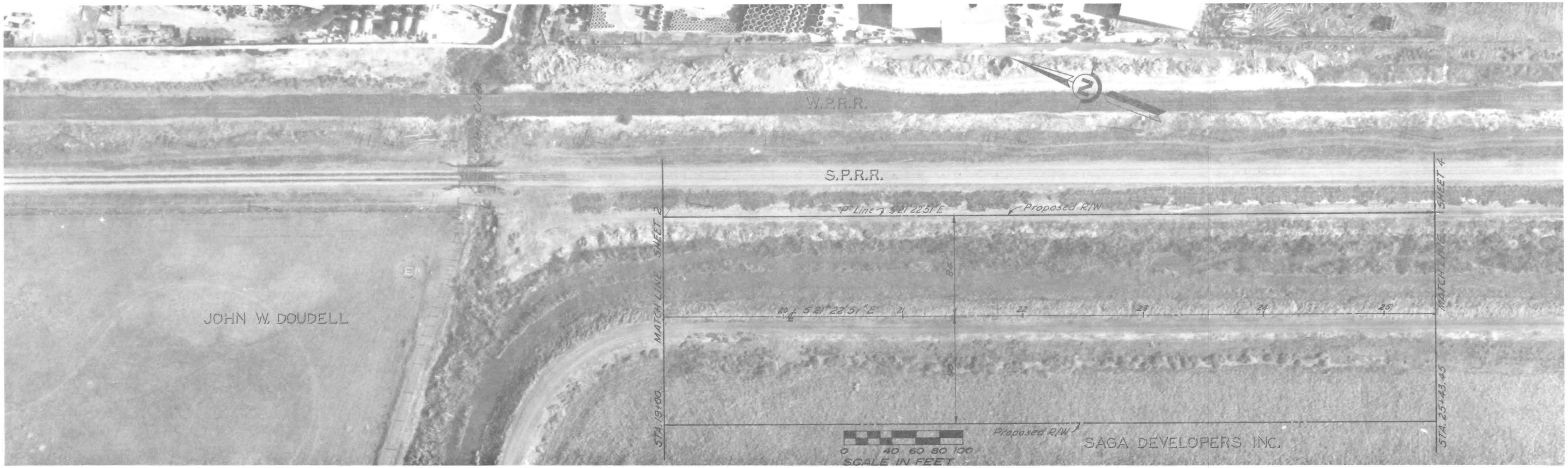
ENGINEERING CERTIFICATION
Michael Freitas
PROJECT ENGINEER
Bruce Wilson
DIVISION ENGINEER R.C.E. NO. 15851

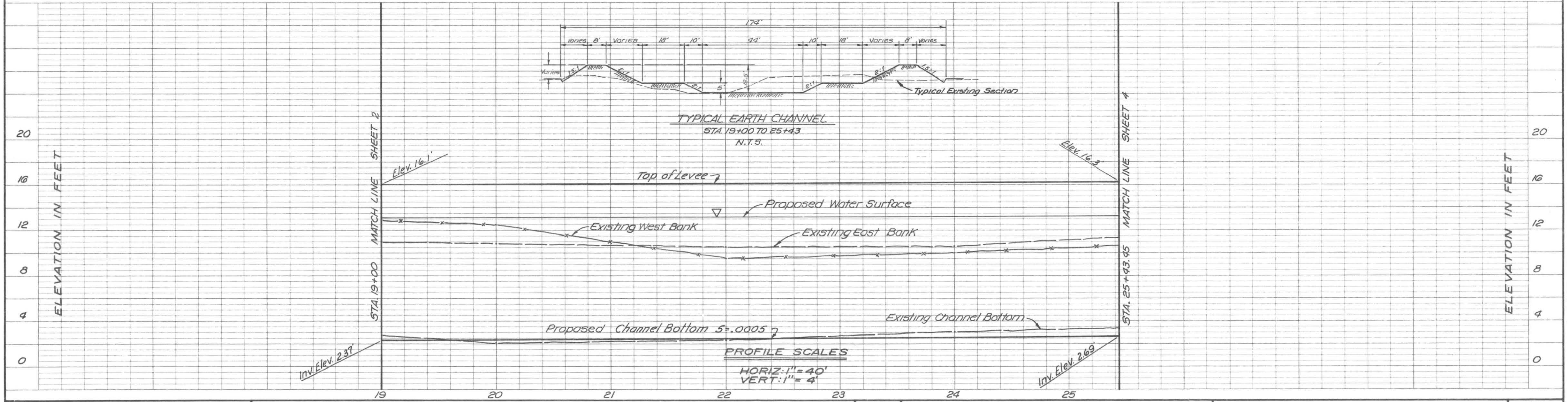
ENGINEERING APPROVAL
Edwin Ferguson
HEAD, DESIGN BRANCH R.C.E. NO. 14455

ZONE E-1
BERRYESSA CREEK
PLAN AND PROFILE

SCALE
AS SHOWN

SHEET
2
OF 11





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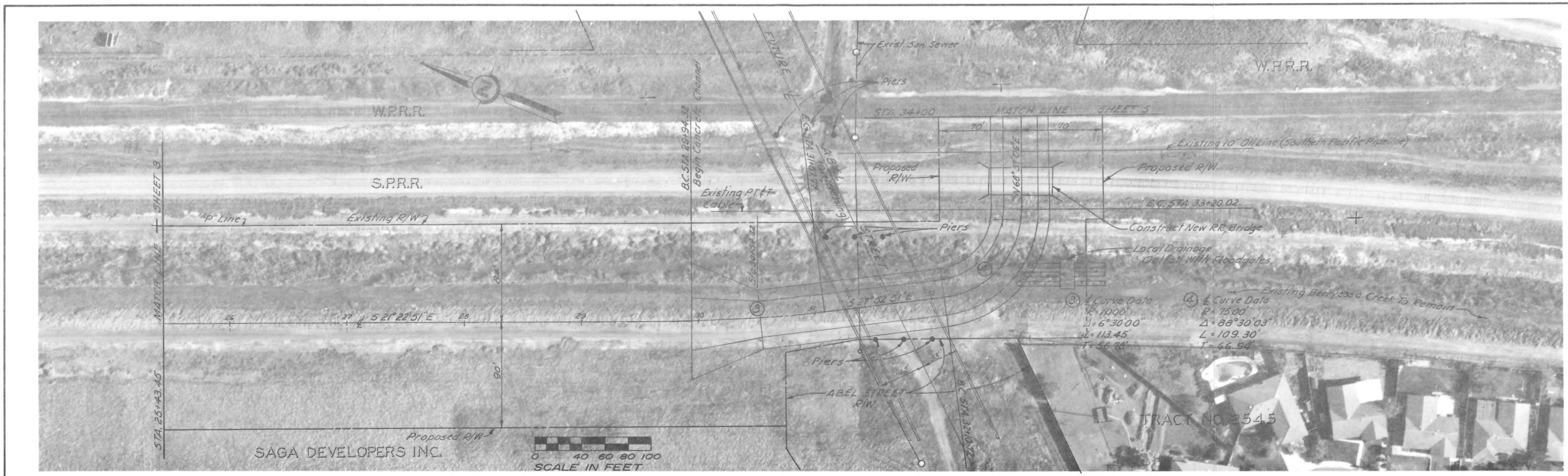
Santa Clara Valley Water District

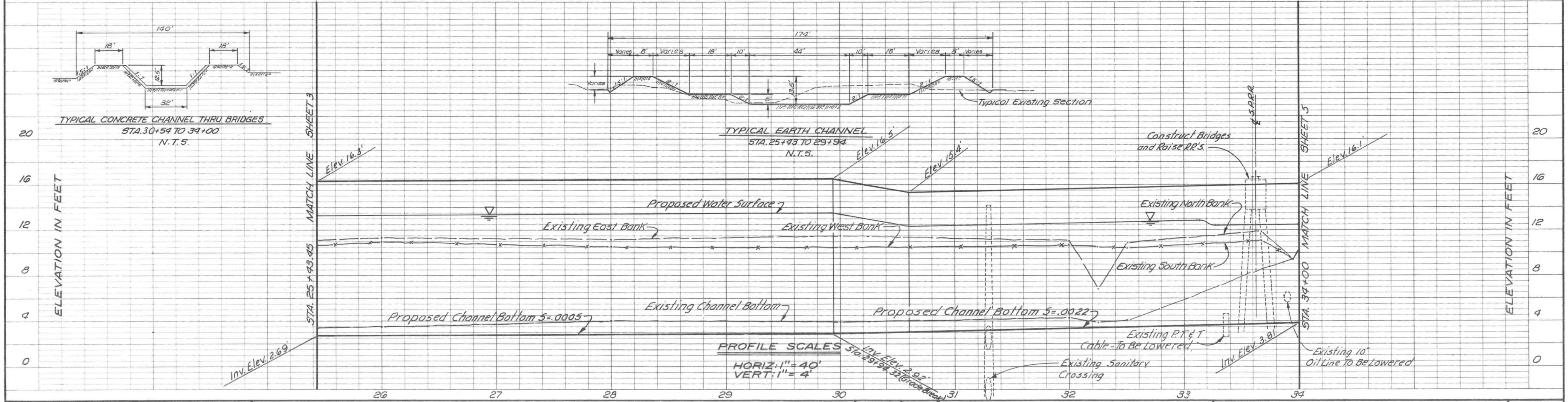
ENGINEERING CERTIFICATION
Michael Freitas
PROJECT ENGINEER
Bruce Wilson
DIVISION ENGINEER R.C.E. NO. 15851

ENGINEERING APPROVAL
Edwin Ferguson
HEAD, DESIGN BRANCH R.C.E. NO. 14495

ZONE E-1
BERRYESSA CREEK
PLAN AND PROFILE

SCALE AS SHOWN
SHEET 3
OF 11





REFER TO TRACING FOR LATEST REVISION

REV.	DESCRIPTION	SUB.	APPR.

REFERENCE INFORMATION AND NOTES

1. The Abel Street Overcrossing Will be Constructed by The City of Milpitas Before The Channel Work and The Railroad Bridges Are Built in This Vicinity.

DATE 5-20-75
DESIGN M.F.
DRAWN R.J.F./G.M.
CHECKED M.F.

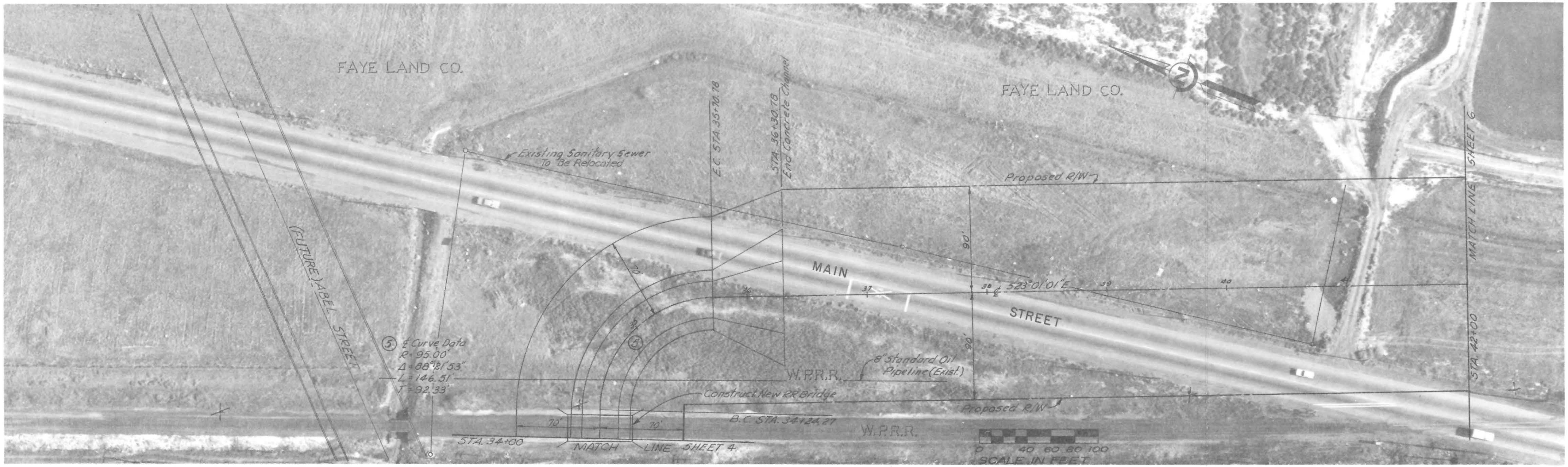
Santa Clara Valley Water District

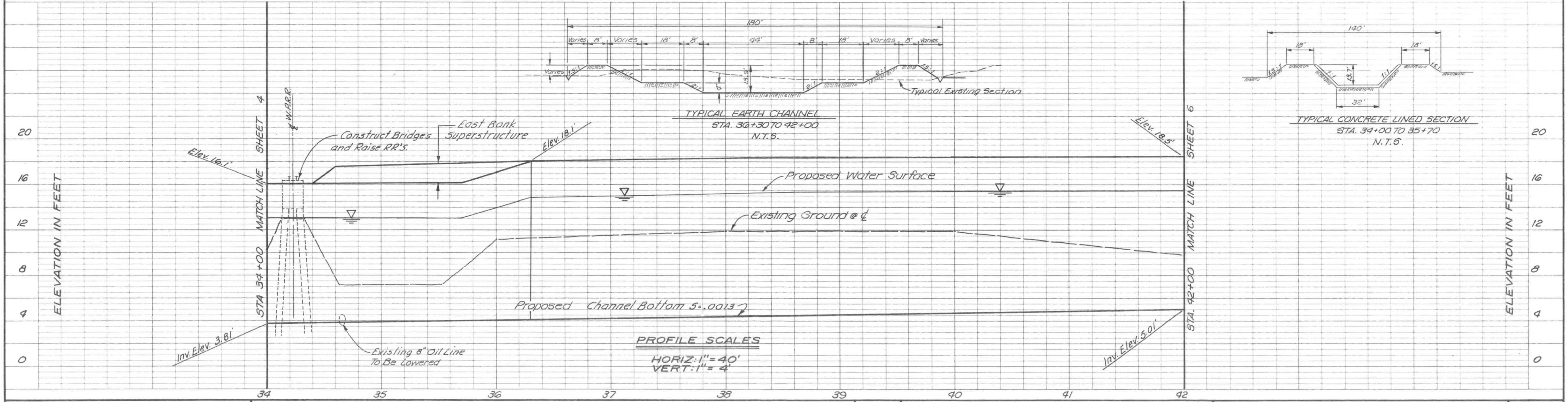
ENGINEERING CERTIFICATION
Michael Freitas
PROJECT ENGINEER
Bruce Welson
DIVISION ENGINEER R.C.E. NO. 15851

ENGINEERING APPROVAL
Edwin Ferguson
HEAD, DESIGN BRANCH R.C.E. NO. 14455

ZONE E-1
BERRYESSA CREEK
PLAN AND PROFILE

SCALE AS SHOWN
SHEET 4 OF 11





REFER TO TRACING FOR LATEST REVISION			
REV.	DESCRIPTION	SUB.	APPR.

REFERENCE INFORMATION AND NOTES

1. Main Street Will be Abandoned By The City of Milpitas After The Abel Street Overcrossing, Shown On Sheet 4, is Opened To Traffic.

DATE 5-20-75
DESIGN M.F.
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CHECKED M.F.

Santa Clara Valley Water District

ENGINEERING CERTIFICATION
Michael Freitas
PROJECT ENGINEER
Bruce Wilson
DIVISION ENGINEER R.C.E. NO. 15851

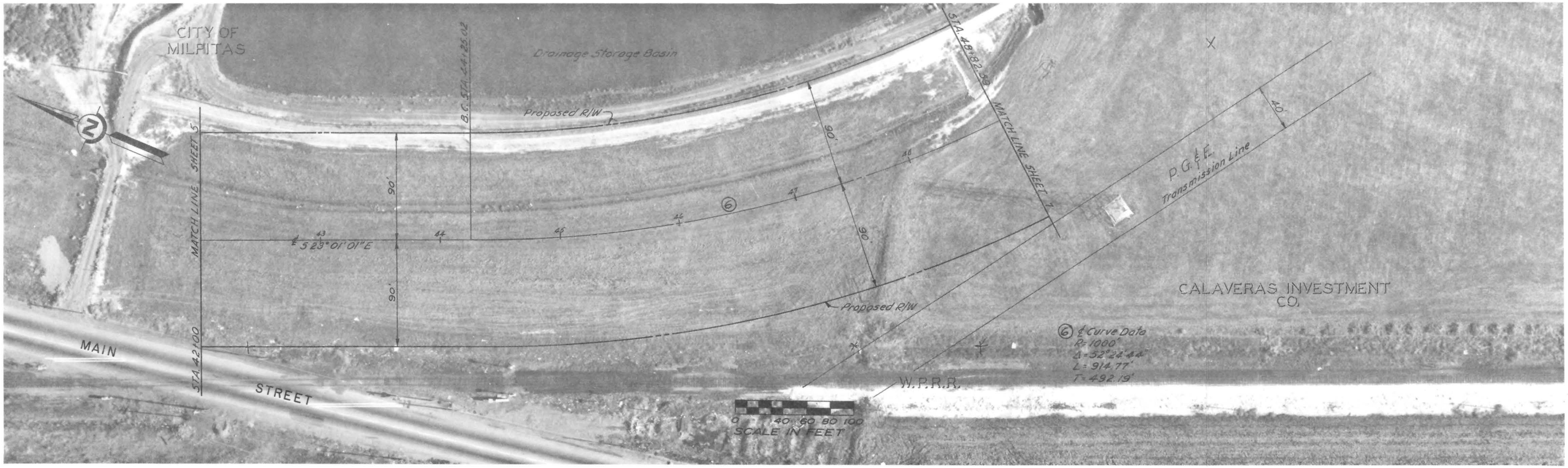
ENGINEERING APPROVAL
Edwin Ferguson
HEAD, DESIGN BRANCH R.C.E. NO. 14455

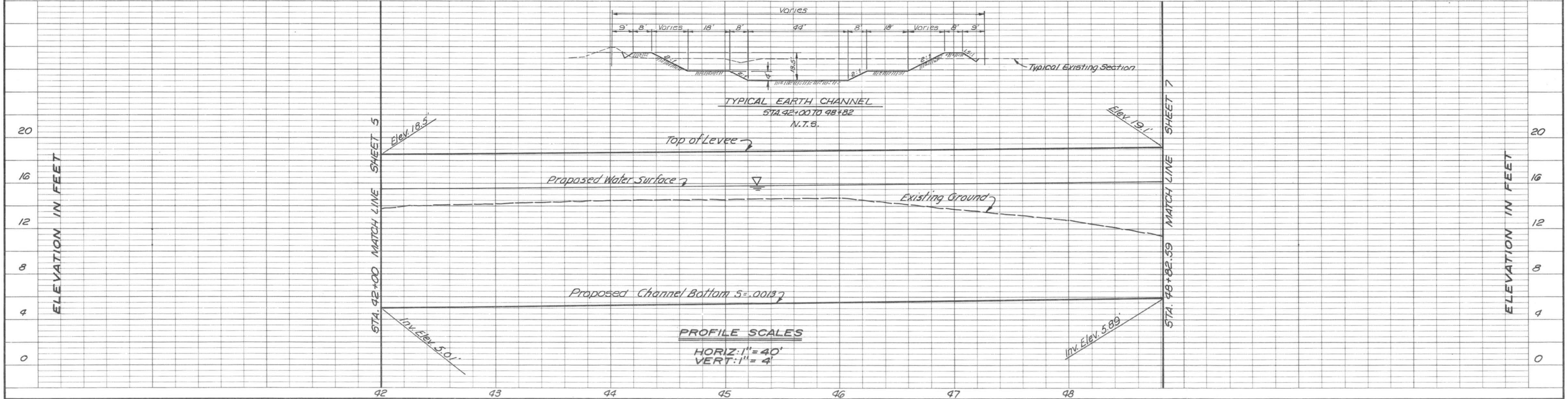
ZONE E-1

BERRYESSA CREEK

PLAN AND PROFILE

SCALE AS SHOWN
SHEET 5 OF 11





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REV.	DESCRIPTION	SUB.	APPR.

REFERENCE INFORMATION AND NOTES

DATE 5-20-75
DESIGN M.F.
DRAWN R.U.F./G.M.
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Santa Clara Valley Water District

ENGINEERING CERTIFICATION
Michael Freitas
PROJECT ENGINEER
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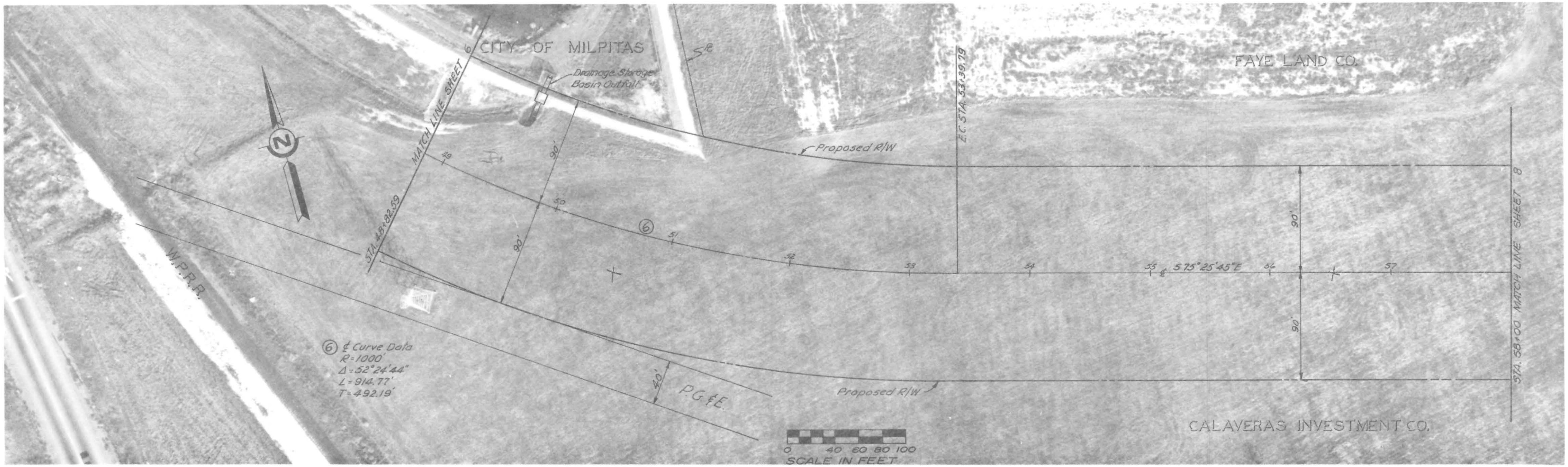
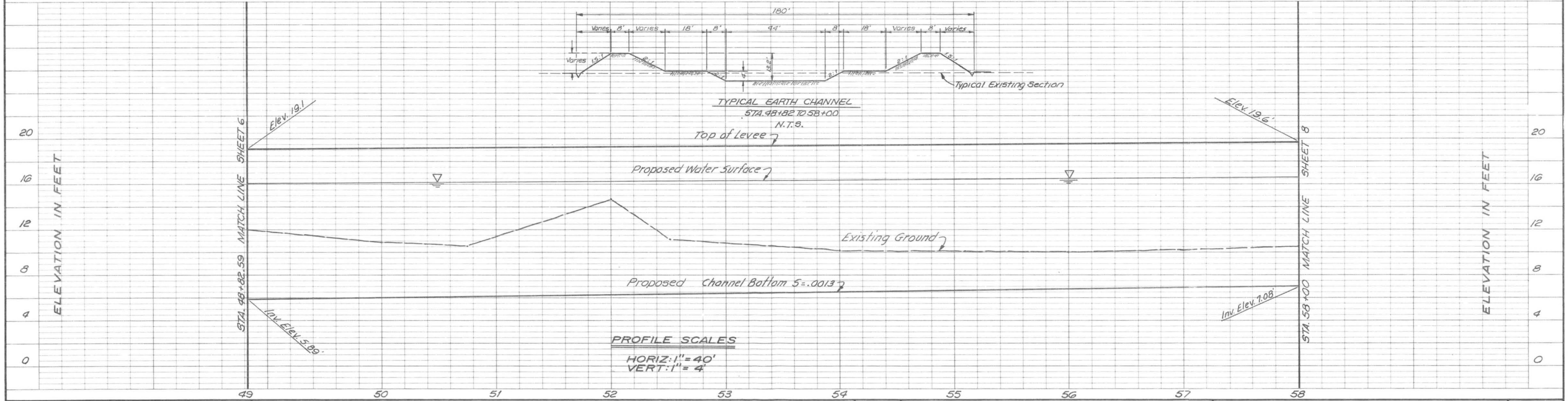
ZONE E-1

BERRYESSA CREEK
PLAN AND PROFILE

SCALE AS SHOWN
SHEET 6 OF 11





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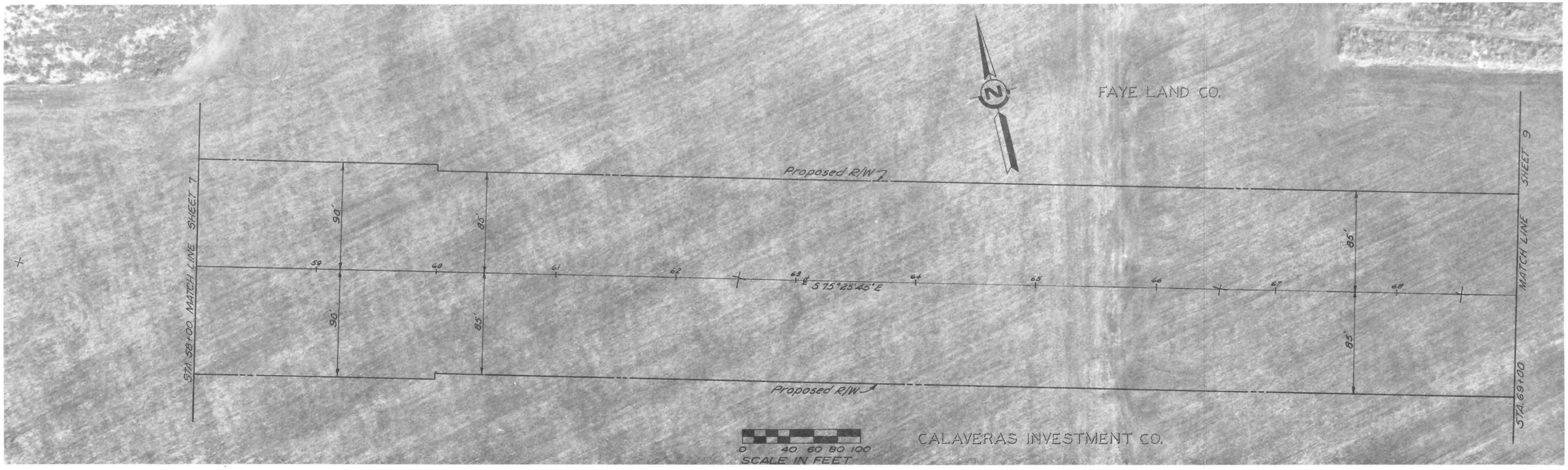
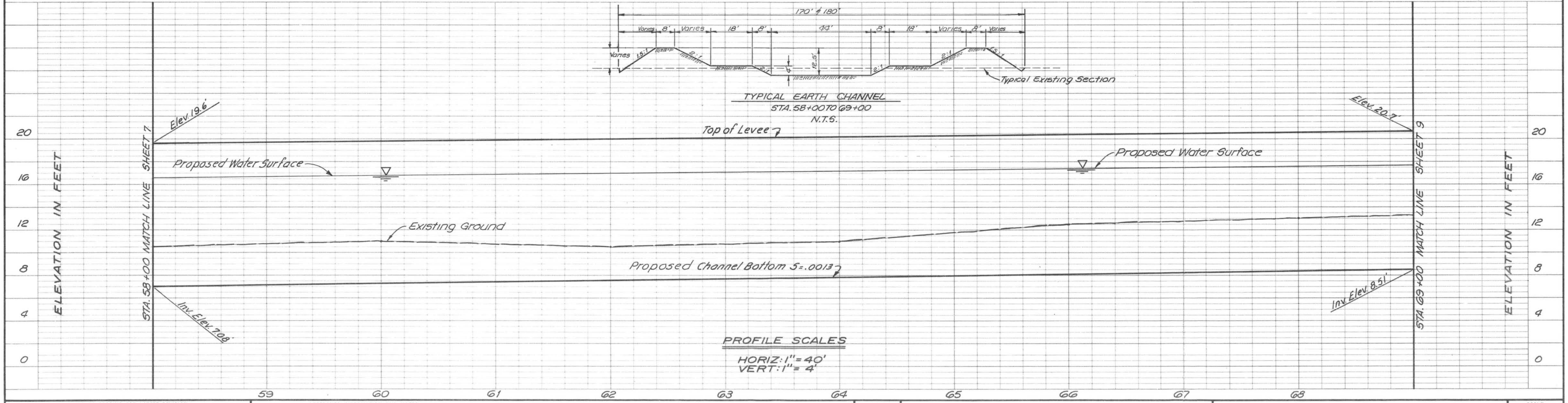
BERRYESSA CREEK
PLAN AND PROFILE

SCALE AS SHOWN
SHEET 7 OF 11





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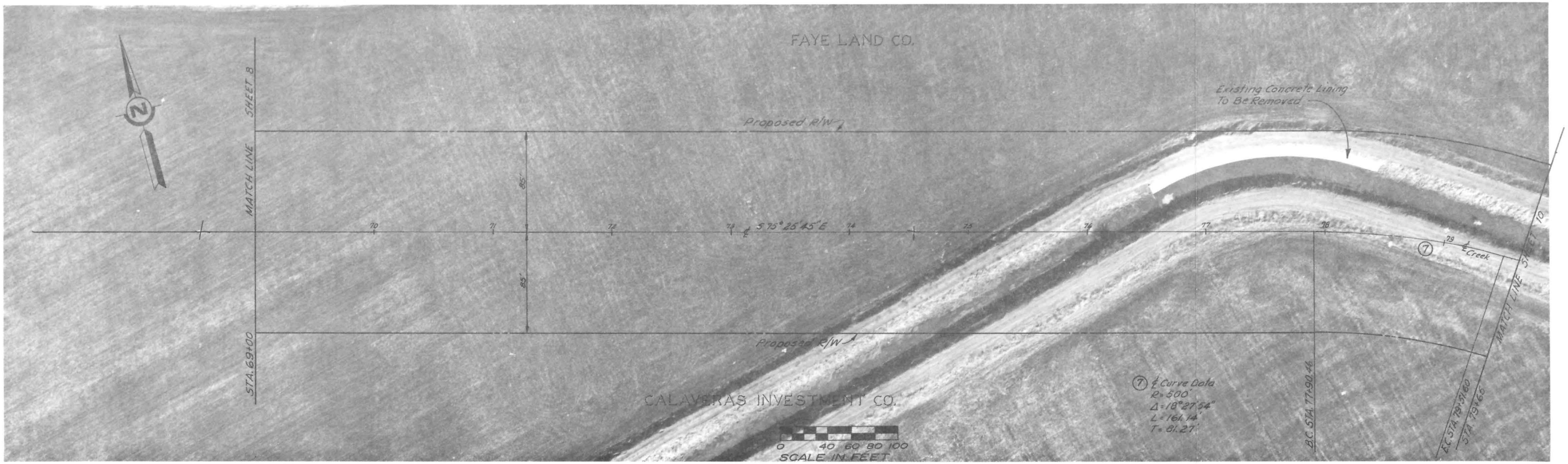
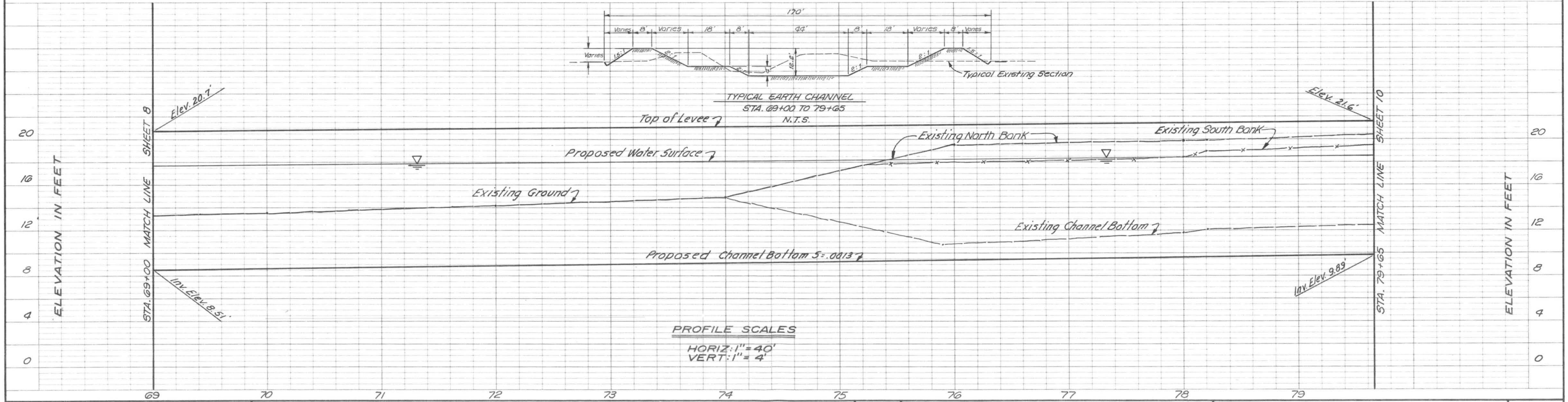
BERRYESSA CREEK
PLAN AND PROFILE

SCALE AS SHOWN
SHEET 8 OF 11





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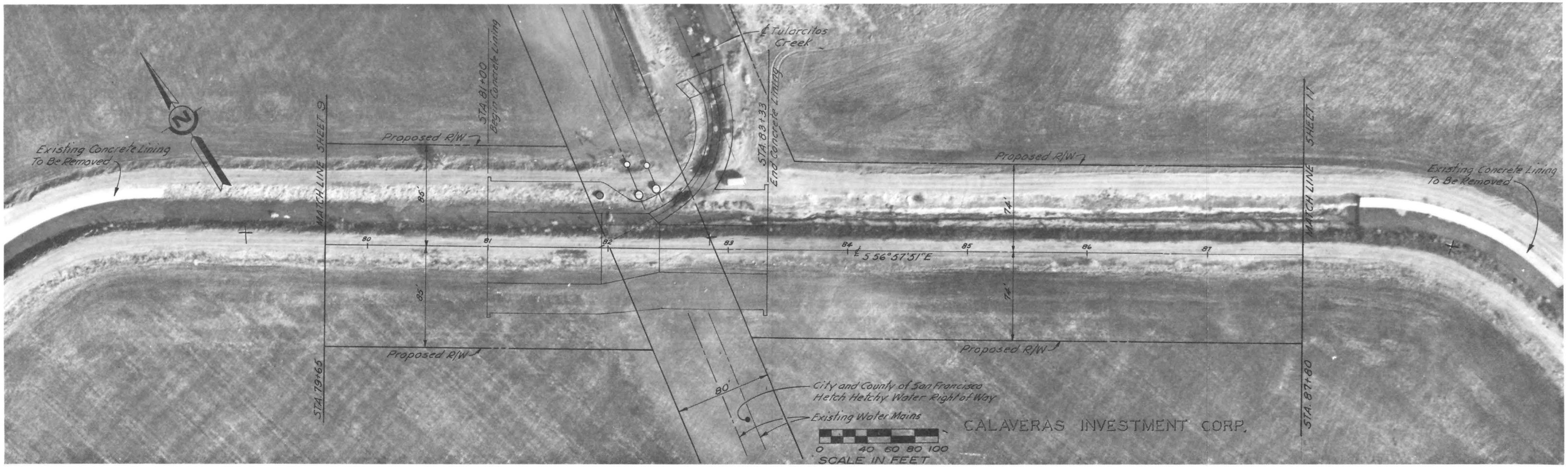
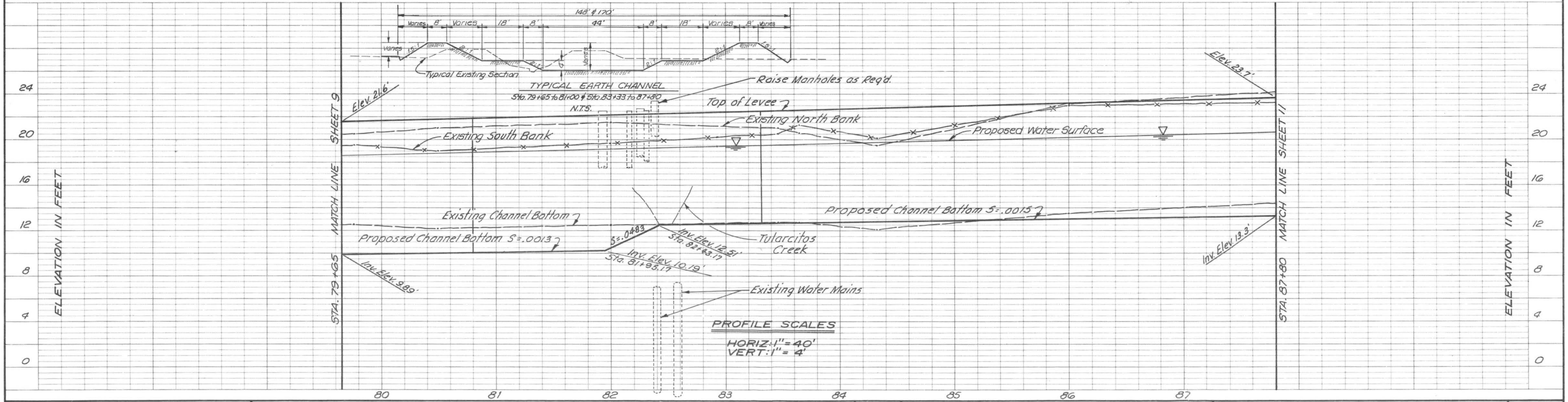
ZONE E-1
BERRYESSA CREEK
PLAN AND PROFILE

SCALE AS SHOWN
SHEET 9 OF 11


N
Existing Concrete Lining To Be Removed
MATCH LINE SHEET 9
STA. 79+65
Proposed R/W
86'
85'
STA. 81+00 Begin Concrete Lining
℄ Tularcitos Creek
STA. 83+33 End Concrete Lining
Proposed R/W
74'
74'
80
81
82
83
84
℄ S 56°57'51"E
85
86
87
MATCH LINE SHEET 11
STA. 87+80
Existing Concrete Lining To Be Removed
80'
City and County of San Francisco Hetch Hetchy Water Right of Way
Existing Water Mains
0 40 60 80 100
SCALE IN FEET
CALAVERAS INVESTMENT CORP.



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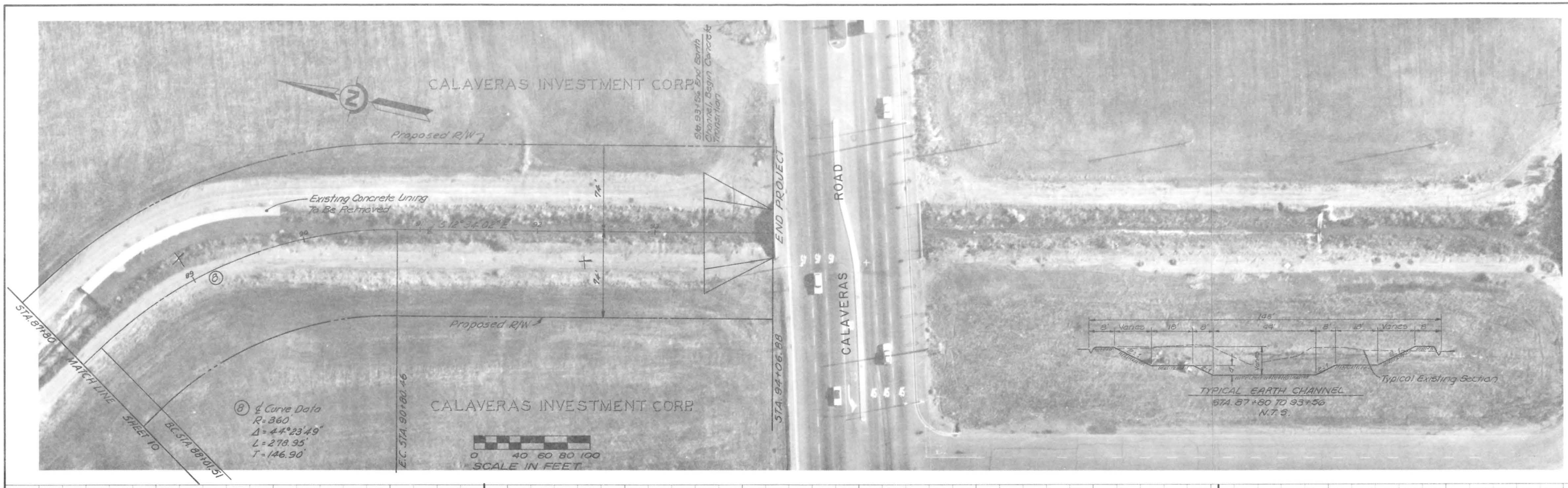
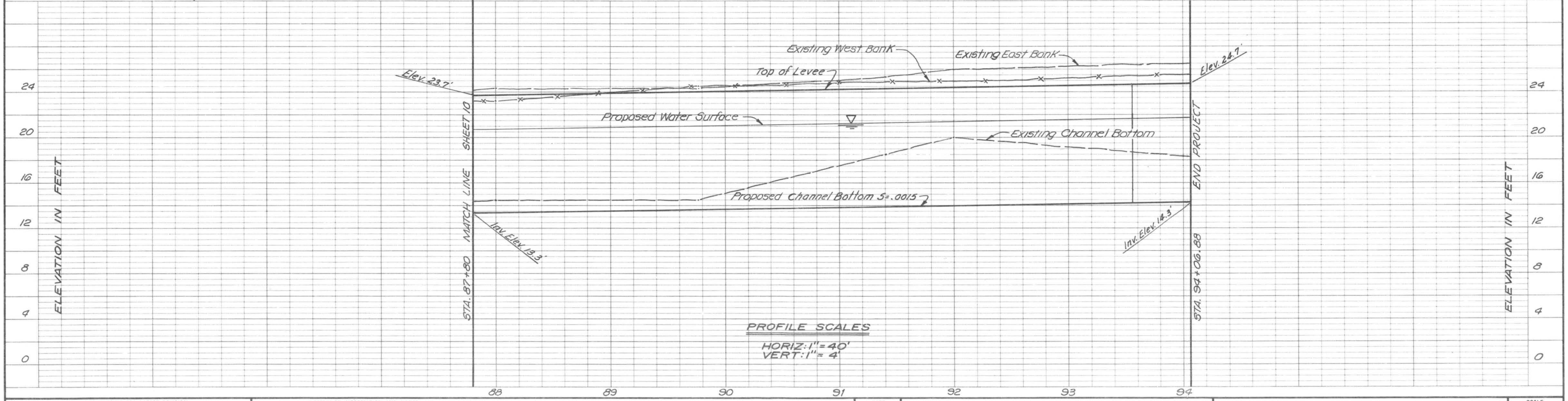
PLAN AND PROFILE

SCALE AS SHOWN
SHEET 10 OF 11





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SHEET 11 OF 11